# Edible Tectonics

## Background

**Plate tectonics** is one of geology's central theories. At once, it explains a wide variety of observations and phenomena. It explains, for example, the distribution of earthquakes and volcanoes throughout the world. It also explains how many of Earth's surface features—such as mountain ranges, ocean trenches, and fault lines—were formed.

To understand plate tectonics remember that the lithosphere is broken up into a number of plates. Some of these plates are large, while others are small. Although the plates touch they are not connected to each other and move independently. Investigating plate movements—where they move and what causes them to move—is what geologists who are interested in plate tectonics do.

Several hypotheses have been offered to explain plate motion. Because plate tectonic hypotheses are difficult to test, not all geologists agree on which hypothesis is best. One popular hypothesis emphasizes the different characteristics of Earth's layers, and the different ways those layers behave. Many geologists think the asthenosphere is made of solid rock, but the extreme heat and pressure cause the solid rock to flow. These geologists think rock in the asthenosphere flows about two or three centimeters every year. Because the lithosphere rides on top of the asthenosphere, many geologists think flowing rock within the asthenosphere causes plate motion in the lithosphere.

Plate tectonics is a unifying theory that helps geologists explain many of Earth's geological processes and physical features. In areas where the lithosphere plates move apart, for example, rift valleys along the crests of mid-ocean ridges can form. Mountain ranges can form in areas where the lithosphere plates move together and collide. In areas where one plate slides beneath another plate after they collide, ocean trenches and volcanoes can form. This Activity uses a scale model to introduce some of these basic concepts in plate tectonics.

### Objective

To investigate how plates move about on Earth's surface and to observe how geologic features form as a result.

### Materials

Each student will need

- ◊ one small Milky Way™ candy bar
- ◊ towels for clean up

### Vocabulary

**Plate tectonics:** The theory and study of plate formation, movement, interaction, and destruction.

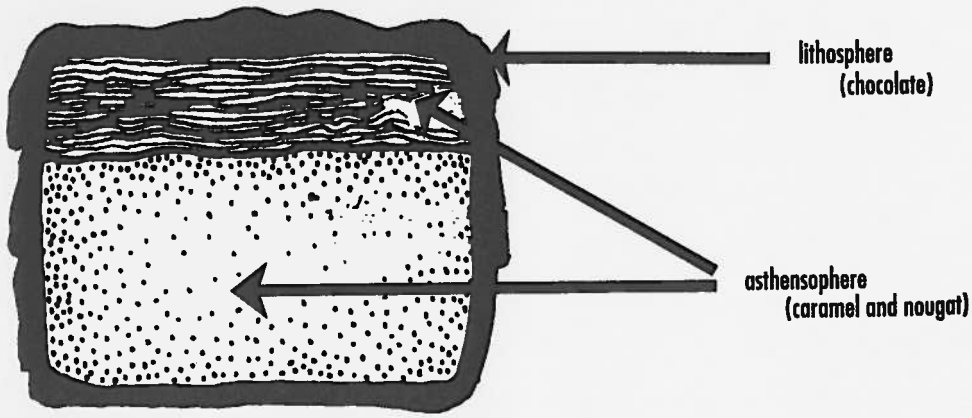
## Procedure

1. Obtain a small Milky Way™ candy bar and a paper towel from your teacher.
2. Carefully unwrap the candy bar and use your fingernail to

make a few cracks across the middle portion of its top. The cracked chocolate models the plates of Earth's lithosphere.

3. Hold the candy bar top facing up, with your left thumb and forefinger holding the sides of one end and your right thumb and forefinger holding the sides of the other end.
4. Slowly stretch the candy bar, pulling it apart a few centimeters at most. The chocolate should separate, exposing the caramel. The exposed caramel represents new material that can rise to Earth's surface.
5. Slowly push the stretched candy bar back together again. The brittle chocolate may crumble. On the other hand, "mountain ranges" may form when pieces of chocolate "plates" collide. Alternatively, one chocolate "plate" may slide beneath another.
6. Continue to slowly pull the candy bar apart and push it back together again. Do this until you have a good sense of how plates can be moved about by the motion of the caramel underneath. When the plates are pulled apart material from beneath can move to the surface. When plates are pushed together they can collide, or one can slide beneath another.
7. Once you have finished, pull the candy bar completely apart. Look at its exposed interior and think of the candy bar as a model of Earth's layers. The top layer of chocolate represents Earth's brittle lithosphere, broken into plates. The caramel and nougat represent the asthenosphere, where the material is solid yet still able to flow (Figure 1).

**Figure 1**



8. After answering the questions below, dispose of your model as instructed by your teacher. Be sure to clean up and to wash your hands.

## Questions/Conclusions

1. Describe the consistency of the candy bar layers. How do they compare and contrast with one another?
2. Using the candy bar as a model for a portion of Earth, what do each of the candy bar layers represent?
3. Describe what you observed when the candy bar was pulled apart. What might you expect to see at a point on Earth where two plates are moving apart?
4. Describe what you observed when the stretched candy bar was pushed together. What might you expect to see at a point on Earth where two plates collide?
5. From your study of plate tectonics, explain the frequent occurrence of earthquakes along the boundaries between plates.
6. One limitation of this model is that human effort—your fingers pulling and pushing—and not natural geologic processes causes "plate" motion. What natural processes might cause the motion of Earth's plates?